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ABSTRACT

This report is a partial review of the Evalution Office of the Seattle, Washington School District's ongoing development of an evaluation method that can be used to compare schools, diverse instructional programs, or similar programs in different settings. The need for a method that can identify educational practices which result in student achievement gains is also emphasized in the review. This paper focuses on the examination of statistical methods that could be used to produce indices of academic gains and to develop a method for study. Reviewed is the evaluation methods selection process that produced a usable evaluation technique which subsequently identified schools showing large academic gains for the 1978-79 and 1979-80 school years. The report states that this method showed only a small number of schools with unusually large or small achievement gains and concludes that few schools are likely to have school-wide educational program characteristics which lead overall achievement anomalies. (Author/APM)

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REPORT NO. 81-3
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EDUCATIONAL EFFECTIVENESS AND STUDENT ACADEMIC GAINS

Background

The Evaluation Office frequently receives requests requiring the capability to directly compare the outcomes of disparate programs. Current evaluation studies are, for the most part, limited to the assessment of individual programs or of programs tied to a specific funding source. A more versatile method is needed; one which can be used to compare schools, diverse instructional programs, or similar programs in different settings.

Another frequently expressed need is for a method of identifying educational practices that are most successful in facilitating student progress. Most current evaluation efforts focus on assessing the effectiveness or ineffectiveness of educational programs, without looking further to determine what characteristics of the schools or programs contribute to that effectiveness.

To meet these needs, the Evaluation Office is engaged in a project to develop an index based on student test performance, which can be used to monitor the academic progress of students in various instructional programs. This index will permit comparisons of test score gains* in various programs and can be used to determine which educational program characteristics are associated with unusual academic gains. Such information is needed to make decisions about which educational practices should be continued, expanded, and/or transported to other sites; which should be studied more intensively; and which should be modified or discontinued. Use of the index could contribute substantially to achievement of the Seattle School Board Goals for 1980-81: to "implement performance standards and evaluation measures in basic courses" and "evaluate selected educational programs for the purposes of assisting in determining where resources should be allocated."

The student performance indicators used in the project were the 1979-80 California Achievement Test (CAT) and the 1978-79 Metropolitan Achievement Test (MAT). Ideally, the performance indicator used would be more closely related to the District curriculum or the student learning objectives. However, such measures are still in the early stages of development. Nevertheless, it is reasonable to use the MAT and the CAT because they sample student performance in areas related to the District's curriculum objectives.

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* The term "gains" is used to indicate adjusted changes in achievement level, not gain-scores.

To date, the Evaluation Office project has focused on the first step of the following sequence of activities.

1. Examine statistical methods that could be used to produce indices of academic gains and develop a method for study.

2. Identify and measure educational program characteristics thought to be related to academic gains.

3. Compare the selected index with measures of educational program characteristics, to establish the educational meaning and value of the index and to determine school characteristics that are highly associated with the index.

4. Make recommendations regarding the continuation, expansion and/or transportability of those aspects of school program which appear to be most associated with unusually large academic gains. Make recommendations regarding the modification or discontinuation of those aspects of school programs which appear to be most associated with unusually small academic gains.

5. Periodically apply the index and measure educational characteristics in order to monitor program changes and identify additional educational aspects that promote academic progress.

This report summarizes the results of the first activity and proposes subsequent activities for the 1980-81 school year.

Introduction

The strategy for this project is different from previous evaluation efforts in several ways: (1) It can be focused on schools as the primary educational program unit; (2) it constructs an index of academic gains which is not influenced by several important factors beyond the control of schools; (3) it provides a means of focusing limited evaluation resources in areas which are most important for program improvement; and (4) it intensively examines educational processes within schools.

Focus on Schools

Schools are studied because they vary in their use of educational resources. A study of educational processes in schools will reveal characteristics that are exceptionally effective in producing academic gains. This information can then be used to support efforts to improve educational programs offered at similar schools which show smaller academic gains.

Focus on Index of Academic Gains

Different schools serve different kinds of student populations so differences in achievement test scores between schools do not necessarily reflect differences in the effectiveness of the educational programs. A statistical index of school academic gains must somehow take into account variations in the student population at different schools and remove differences that are due to factors beyond the control of schools, such as initial achievement and economic status of students. There are numerous methods that could be used to make the adjustment and the appropriateness of each method is the subject of debate. In January 1980, a committee of evaluators was assigned to review methods, choose the most useful and valid method and apply that method to identify schools which show unusual patterns of academic gains.

The following points summarize the committee's conclusions:

1. Multiple regression analysis is the most viable approach. It produces estimates of schools' academic gains, eliminating the effects of major non-school factors; it is relatively simple to use; and, it yields results that are similar to other approaches.

2. While the index itself appears to provide a useful point of departure for focusing evaluation efforts, it is necessary to intensively study the relationship between educational program characteristics and statistical index scores of schools in order to establish the educational meaning and value of the index.

3. Once validated, the index can be used in a continuing search for educational program characteristics that are related to academic gain and to monitor program changes.

Evaluation Focus

Typically, evaluation efforts have studied special programs like Title I or Project Follow Through. Although these efforts yield useful information, they often fail to provide information which can be used for improving the overall educational program of students. By employing a strategy that examines achievement patterns in schools, characteristics of the total educational program can be identified that are especially important to a child's academic achievement.

Focus on Educational Processes

An integral component of this project involves the direct measurement of educational processes that contribute to academic gains. With such an examination it will be possible to determine which processes are more effective than others. This information can be used for making program improvement decisions; e.g., to transport effective processes or to modify or eliminate those that are ineffective.

Method Selection

Thirteen methods of identifying schools with unusually large or small academic gains were developed or selected for comparison and each was applied to 1978-79 grade 6 reading subtest scores of the Metropolitan Achievement Test. The methods showed considerable overlap but not total correspondence in the index scores produced. As intended, all indices were essentially free of the effects of students' initial achievement level, ethnic category, and economic status.

The selected method is as follows: initial achievement (measured by fall test scores), ethnic category and economic status (measured by free or reduced-price lunch eligibility) are used to compute a predicted, or expected, spring test score for each student using multiple regression. The expected spring score is the score that would be predicted based on a knowledge of initial achievement, economic status, and ethnic category. The average difference between the expected spring scores and actual spring scores, at each grade level, in reading and math is computed for each school and then adjusted to account for differences in the number of students tested and the unreliability of the test scores. The final index, called a Z score, indicates the confidence with which it is possible to say that the achievement gains were not due to chance differences, but likely to be related to educational program characteristics. Large (or small) achievement test score gains lead to large positive (or negative) Z scores. Greater unreliability of test scores and/or a smaller number of students tested will reduce the magnitude of the Z score. Again it is important to note that differences in the index are <u>not</u> due to initial achievement, ethnic group membership, or economic status.

The above method was then used to identify schools showing unusual academic gains during the 1978-79 school year, using the MAT, and the 1979-80 school year, using the CAT. Identification of schools during the 1979-80 school year is important because the stability in school and grade configurations from 1979-80 to 1980-81 will allow a study of educational program characteristics this year, based on index scores computed on last year's data. This situation was not the case in previous years and will probably not be the case next year.

Results

School Effects

Considerable differences were found between reading and math achievement gains at individual schools, between various grade levels, and from year to year at the same schools and grade levels. For example, fifty-eight of the seventy-seven elementary school buildings had unusually large or small index scores for at least one grade level, in at least one subject area, during the 1979-80 school year, using a conservative statistical definition* of "unusual". Figures 1 and 2 show the distribution of index scores for elementary schools in reading and math. Since each school is represented as many times as it had tested grade levels, there are 327 data points in Figures 1 and 2.

While there are substantial differences between subject areas and grade levels, only a small number of schools show consistently large or small achievement gains. Therefore, only a few schools are likely to have school-wide educational program characteristics that lead to unusually large or small educational gains, as measured by the index. Factors that are associated with individual subject areas and grade levels are more likely to have such characteristics.

* Only one chance in one hundred that the results are due to chance differences, as opposed to the more conventional one chance in twenty.

Proposed Activities for 1980-81

Because the index could play an important role in making decisions about program improvement, it is essential that its value and educational meaning be established. While it is known that the index is not related to student ethnic category, economic status, or prior achievement level, it is not known to what factors it is related. It is expected that differences in educational programs contribute to variations in the index. It is also possible that test administration procedures or programs designed for special student populations lead to some of the results; or, that student differences not accounted for by the statistical procedure, such as physical handicaps or emotional problems, would lead to unusual index scores. The following activities are proposed for 1980-81 to refine the index and determine the conditions under which it can be most effectively used.

1. Develop and implement a plan to identify pertinent school characteristics that can be directly observed. Develop observation techniques.

2. Train observers to use observation techniques.

3. Observe and measure school characteristics.

4. Examine the relationship between observation results and the statistical index.

5. Report on the relationships between school characteristics and the index and how these relationships clarify the meaning and value of the index.

It is expected that some educational program characteristics, such as the following, will be related to the statistical index if it is a valid measure of effectiveness. Their measurement will require direct observation.

1. Principal and teacher emphasis on basic skills.

2. Academic Learning Time (used in the NIE study, "Time to Learn") in reading and math.

3. Instructional organization and structure.

4. Student motivational strategies.

Other factors that may be related to index scores can be measured centrally.

1. Staff turnover.

2. Ethnic distribution.

3. Student-teacher and teacher-administrator ratios.

Input concerning pertinent characteristics should come from a wide range of sources--school administrators, teachers, parents, and previous research. Standard measurement techniques must then be developed so that program observers can accurately and consistently assess the selected characteristics. The goal of the proposed 1980-81 activities is to report on the relationship of the

selected measures of educational program characteristics to the index of academic gains.

FIGURE 1

FREQUENCY DISTRIBUTION OF 1979-80 READING Z SCORES
FOR EACH TESTED GRADE LEVEL--IN EACH
ELEMENTARY PROGRAM (N=327)

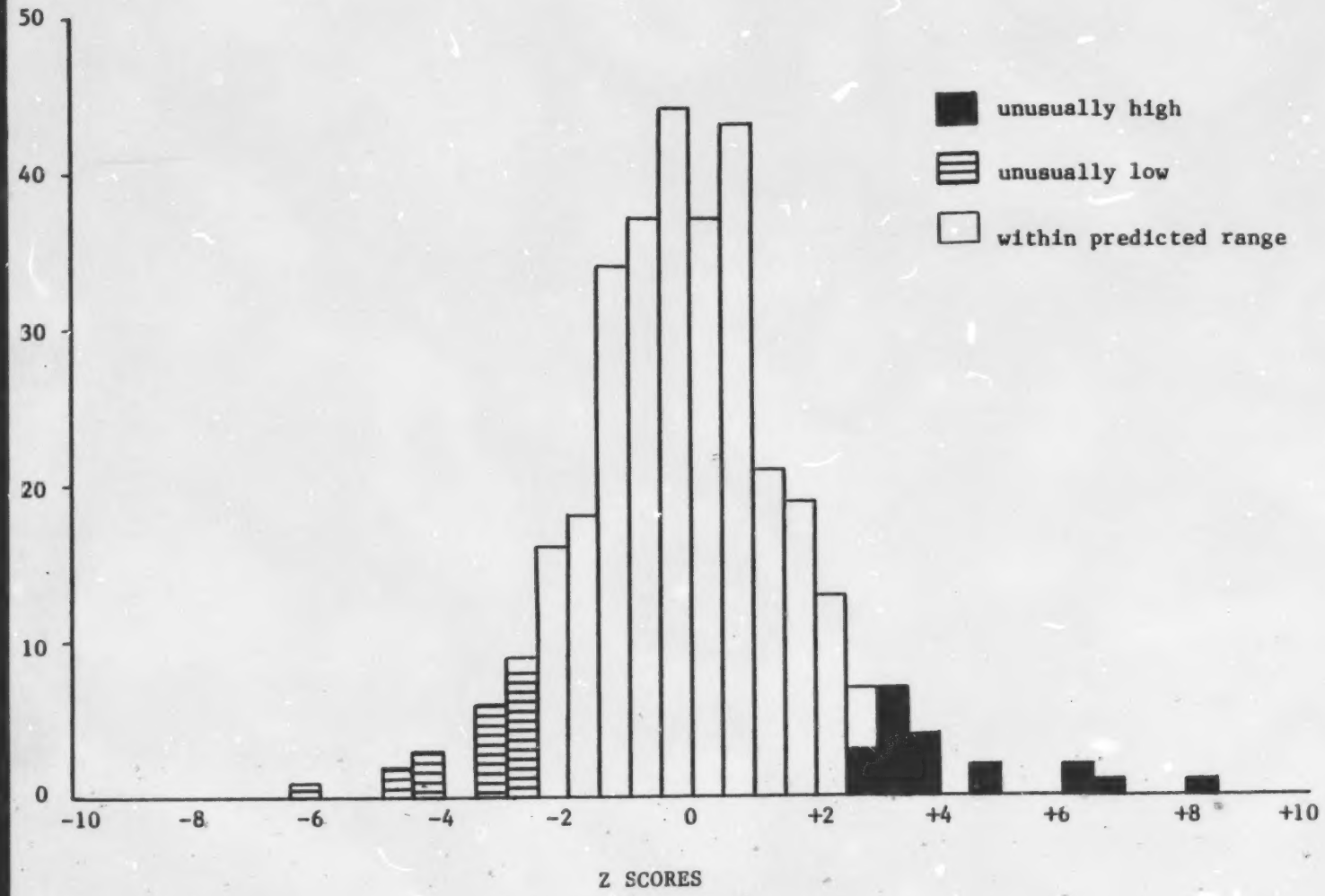

FIGURE 2

FREQUENCY DISTRIBUTION OF 1979-80 MATH Z SCORES
FOR EACH TESTED GRADE LEVEL--IN EACH
ELEMENTARY PROGRAM (N=327)